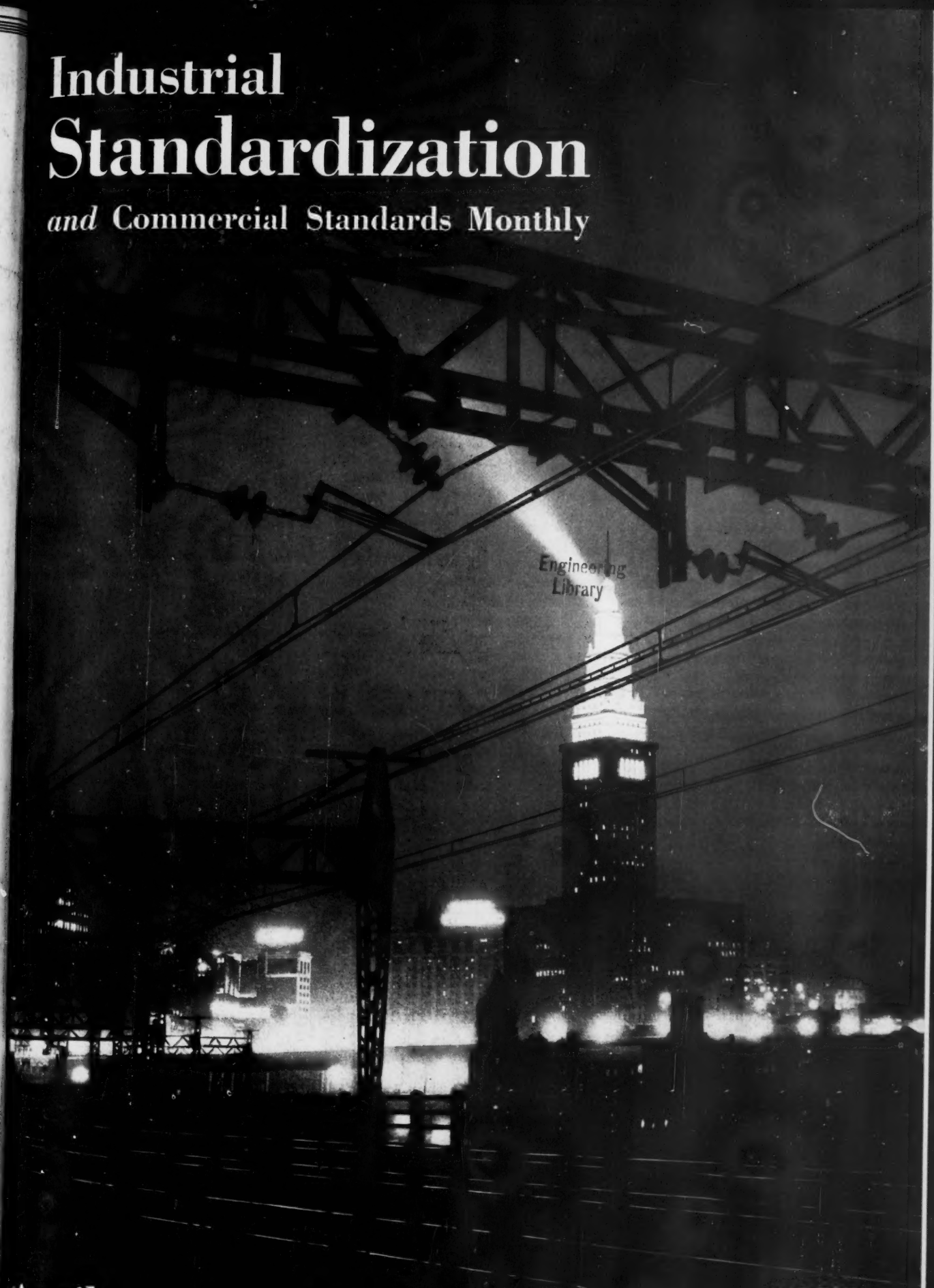
Industrial Standardization

and Commercial Standards Monthly



April

See Article on Page 91

1937

This Issue: *Front Cover: Night view — Cleveland Union Terminal — showing 3000-volt direct-current trolley construction. Courtesy Anaconda Wire & Cable Company.*

ASA

AMERICAN STANDARDS ASSOCIATION

APRIL 1937

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Standardization Results—

Better Trolley Wire Less Breakage

Years of work bring agreement on tests, strength requirements, tolerances

Approval by American Standards Association recognizes general acceptance

by

H. S. Murphy

Second Vice-President,
American Transit Engineering Assn.

THE acceptance by the American Standards Association as American Standards of the trolley wire specifications prepared by the Conference Committee representing the American Transit Association, the American Society for Testing Materials, and the Association of American Railroads is the result of a movement started in 1921 by the A.T.A. (then known as the American Electric Railway Association).

At that time, in spite of the fact that trolley wire had been in use for 30 years, there were two generally accepted specifications for copper trolley wire in use and all previous attempts to reconcile them had failed. No specifications for bronze wire were in existence.

The A.S.T.M. specification considered trolley wire as hard drawn copper line wire classing it with wire used for general power and communications purposes. The A.E.R.A. specification treated trolley wire as a separate product because of its use as an inverted track and included tests not considered necessary or desirable in line-wire specifications. Many years operating experience of railway engineers showed that satisfactory trolley wire was not always obtainable under A.S.T.M. specifications and some wire makers had objections to the A.E.R.A. specifications.

Experience in the use of trolley wire indicated that it required a better surface finish and more care in manufacture than ordinary line wire which was only subject to direct tension. This had resulted in the development of torsion tests and it was in these tests that the specifications differed. It is easier now than it was then to imagine the results if a locomotive pantograph operating at 90 mph should contact a splintered wire.

The confusion occurring from two major specifications resulted in a conference between representatives of the two Associations in May, 1922. At that meeting, after very full discussion, "the manufacturer members were requested to provide a substitute for torsion tests which would give the results desired by the trolley wire users." It was also decided that the specification should provide for sizes of grooved wire larger than any then in use to cover possible use in steam railroad electrification and that it should be used as a basis for an American Standard. The Conference also started preparing specifications for bronze trolley wire.

The committees again conferred on April 27, 1923, without any common ground having been found regarding the torsion tests. As that meeting was approaching a conclusion without definite

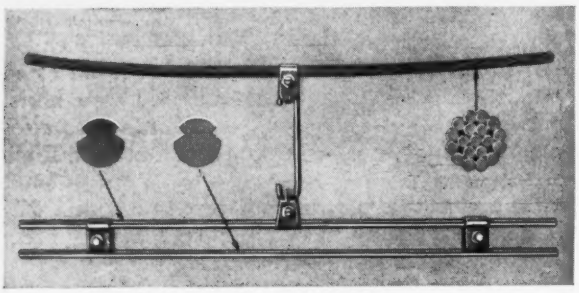
Courtesy Philadelphia Rapid Transit Co.

37 trolley wires enter this street car terminal. Contact wire for trolley cars, trolley buses, and electric railways are covered by the American Standard specifications.

results the problem was solved by the late W. H. Bassett. He had a piece of twine in his hands twisting and untwisting it and finally remarked, "Well, I must admit that if I want to know what is in this the simplest way to find out is to untwist it." This broke the ice—a qualitative torsion test was set up and a joint specification for copper trolley wire prepared, submitted to both Associations, and adopted as a tentative standard at their 1923 Annual Meetings.

Detail of the trolley construction used by the Pennsylvania Railroad—11000 volts alternating current. Cross sections of the main messenger, 5/8 in. 19 wire (top), the auxiliary messenger 4/0 grooved copper wire (center) and the contact wire 4/0 grooved are shown. Arrows indicate the wire to which each section applies.

Courtesy Anaconda Wire and Cable Co.



The first bronze specifications were adopted in 1925 and the strength requirements were purposely set extremely high. The A.S.T.M. and A.T.A. specifications differed somewhat in the number of twists required and this continued until 1927 when all differences were cleared up.

In 1933 the two standards, on copper trolley wire and on bronze trolley wire, were submitted to the American Standards Association for approval as American Standard with the American Society for Testing Materials as sponsor. It was discovered, however, that to meet the needs of the manufacturers of trolley wire fittings dimensional tolerances for grooved wire were necessary. The question of the tolerances was, therefore, given further consideration by the Conference Committee and in 1935 revised standards were submitted to take the place of the original submittal. In the revised standards such tolerances have been included.

Since the initiation of this project in 1921 the scope of the Conferences has broadened to include the Association of American Railroads, the American Mining Congress and the National Electrical Manufacturers Association so that all groups having a major interest in the use, manufacture, and installation of trolley wire have cooperated in the final result.

When a specification attains the status of an American Standard it is pertinent to inquire as to the results which will follow in improving the

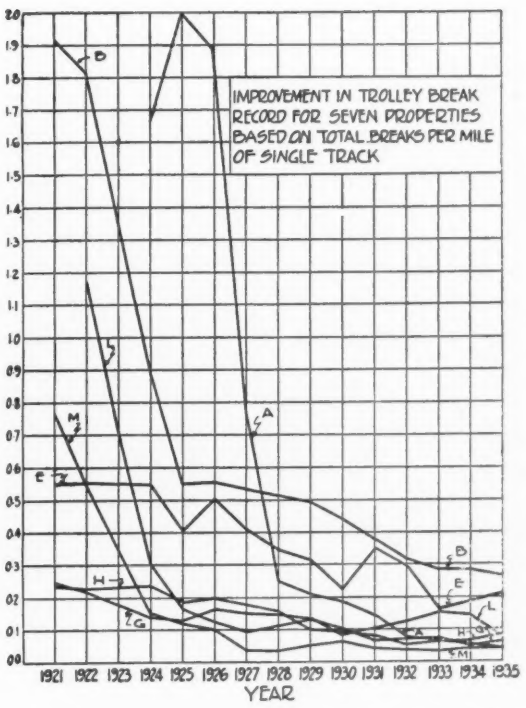
product covered. The present specifications do not differ materially from those originally prepared and therefore have been tested in actual use. It is our belief that larger users of trolley wire will agree that there has been an improvement and that it has occurred without increasing costs. Evidence to support this exists in the records of the American Transit Association Committee on Trolley Wire.

Almost simultaneously with their work on specifications this group started a study of trolley wire performance using trolley breaks as their base. The result of the publication of these data obtained from a representative group of users has undoubtedly improved maintenance practices with resulting decrease in failure but it cannot be denied that better wire contributed very greatly to the betterment shown.

	1924	*1935*
Miles of line covered by report	7,178	9,938
Total trolley wire breaks	3,599	1,774
Breaks due to worn wire	1,018	501
Per cent of total	28.3	28.0
Breaks due to flaws in wire	348	29
Per cent of total	9.7	2.0

In addition to this, the trolley break records based on breaks per mile of line of seven large properties have been charted covering the period from 1921 to 1935. Results such as are shown here would have been impossible without satisfactory trolley wire.

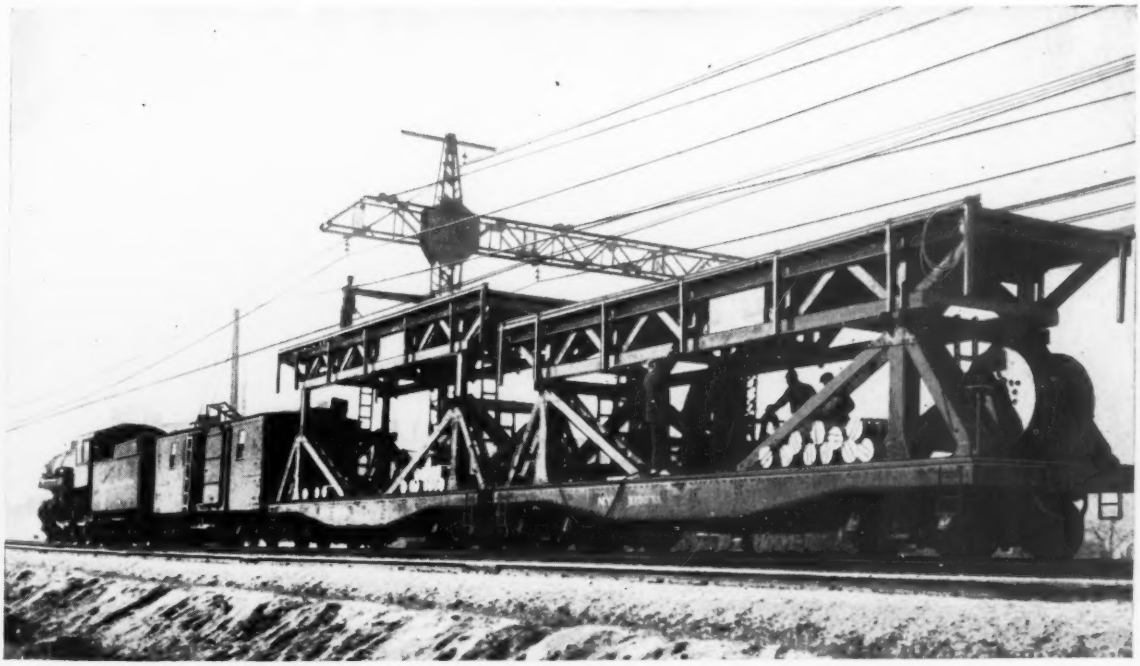
Trolley wire constitutes a major use of copper.



Improvement since 1921 in number of breaks in trolley wire per mile of trolley car operation on seven different properties.

Installing overhead electric trolley wire for the Cleveland Union terminal. (See cover picture)

Courtesy Anaconda Wire and Cable Co.



Trolley Wire Standards Have Been Published

The American Standard Specifications for Bronze Trolley Wire (H22.1-1937; A.S.T.M. B 9-36) and the American Standards Specifications for Copper Trolley Wire (H22.2-1937; A.S.T.M. B 47-36) give specifications and tests for round and grooved trolley wire agreed upon under the procedure of the American Standards Association by groups of manufacturers and users.

The specifications have been prepared co-operatively by American Society for Testing Materials, American Transit Association and Association of American Railroads, and the ASTM as sponsor will continue to have responsibility for future revisions.

Copies of the standards may be obtained from the ASA office at 25 cents each. Discounts are available to Members of the American Standards Association.

As of December 31, 1936 the surface electric railways in the United States and Canada operated 26,789 miles of line. In addition to this trackless trolleys (trolley coaches) now operate on 855 miles of route equivalent of 1,710 miles of overhead trolley; this particular use for trolley wire has arisen since active work on these specifications was undertaken.

As was anticipated by the original Conference, trolley wire has proven to be the best method of distributing power to electrified railroads which now operate 4,755 miles of trolley line. The Pennsylvania Railroad has just announced the proposed extension of main line electrification from Paoli to Harrisburg, Pa., which involves a number of branch lines and will cover 773 miles of track. When completed this system alone will have 2,677 miles of electrified line.

It is impossible to state accurately the weight of copper in active use in these installations which have a total length of 33,254 miles, but a conservative estimate indicates that it far exceeds 86,300,000 pounds. This wire is being constantly worn by current collecting devices and it has been estimated that normal replacements require more than 7,500,000 pounds of copper annually. It is easily seen that such enormous use necessitates proper specifications to obtain satisfactory material.

International "Vocabulary" Soon to be Available

The International Electrotechnical Commission plans publication of the first edition of its international "Vocabulary" for early in 1937. This work, undertaken soon after the St. Louis Electrical Congress in 1904, contains some 2,000 scientific and industrial terms used in the various branches of electrotechnics. It is the result of many years of continuous effort by a committee of experts including delegates from Austria, France, Germany, Great Britain, Italy, the Netherlands, Poland, Spain, and the United States.

The whole work is divided into 14 sections, the first of which covers fundamental and general definitions. The others more specifically deal with: machines and transformers; switchgear and control gear; apparatus for scientific and industrial measurements; generation, transmission, distribution; electrical traction; power applications; thermic applications; lighting; electro-chemistry; telegraphy, telephony; radiology; electro-biology. Definitions appear in both English and French, the two official languages of the I.E.C.; and a translation of terms alone is given in German, Italian, Spanish, and Esperanto. Translation of the terms into additional languages will undoubtedly be undertaken in future editions.

While the committee developing this "International Vocabulary" appreciates that it does not constitute a complete unification of electrotechnical nomenclature, it believes that through periodic review and revision based on the constructive criticism of electricians of the world, it should become increasingly valuable to engineers.

As the edition will be limited, copies should be reserved at once by writing to the United States National Committee of the International Electrotechnical Commission at 29 West 39th Street, New York. The price of the "Vocabulary" will come to about $2.50.

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N.F.P.A. Issues Standard For Spark Arresters

The Standard for Construction and Installation of Spark Arresters for Chimneys and Stacks, prepared by the Committee on Manufacturing Hazards of the National Fire Protection Association, and adopted by the Association at its 1936 annual meeting, has been reprinted in pamphlet form. Copies may be obtained from the N.F.P.A., 60 Batterymarch Street, Boston, Mass., at five cents each.

New Cast Iron Soil Pipe Standards Achieve Wide Recognition

THE new American Standard for Cast Iron Soil Pipe and Fittings, developed through the cooperation of some twenty-two organizations under the auspices of the American Standards Association, is achieving wide recognition on the part of municipal, state, and Federal agencies in the building field.

The city of New York through action by the Board of Buildings has just approved the use of extra-heavy cast-iron soil pipe made in accordance with the new American Standard specifications. This means that installation of the new pipe and fittings will now be permitted in building construction throughout the city, making available important advances in this type of pipe and fittings.

Material made in accordance with the standard complies with Federal Specification WW-P-401, issued by the U. S. Director of Procurement to cover all purchases of such material by Federal agencies. Such material is acceptable for all buildings erected or supervised by the Federal Government.

The manufacturers of soil pipe, who have been keenly interested in the development of standards in this field, officially adopted the American Standard last December and are now in a position to furnish pipe and fittings in accordance with the standard for installation in both public and private construction.

The need for a standard for cast-iron soil pipe and fittings has been apparent for some years. Undertaken in August, 1928, the work was completed and the standard approved by the American Standards Association in October, 1935. Development of this standard is part of a comprehensive program in the plumbing field by a representative committee organized under the auspices of the American Standards Association and sponsored jointly by the American Society of Sanitary Engineering and The American Society of Mechanical Engineers. The twenty-two organizations officially participating in the development and approval of the standards are listed in the box herewith.

Organizations represented on Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment:

American Ceramic Society
American Civic Association
American Hospital Association
American Home Economics Association
American Hotel Association
American Institute of Architects
American Marine Standards Committee
American Society of Mechanical Engineers
American Society of Sanitary Engineering
American Society for Testing Materials
American Waterworks Association
Cast Iron Soil Pipe Association
Cleveland Engineering Society
Copper and Brass Research Association
Manufacturers Standardization Society of the Valve & Fittings Industry
National Association of Building Owners & Managers
National Association of Master Plumbers of the United States
National Slate Association
Real Estate Board of New York
Society of Naval Architects and Marine Engineers
U. S. Department of Commerce, National Bureau of Standards
U. S. Navy Department

In August, 1936, the American Municipal Association circulated an announcement advising municipal officials that the new standard was ready for use. This announcement indicated the care which had been exercised in the development of the standard to harmonize the weights and lengths of soil pipe and fittings with trade requirements and the best sanitary practice.

At that time manufacturers believed that a two-year period would be necessary for pattern and plant development to care for changes in practice called for by the new standard. However, on January 1, 1937, manufacturers announced that all sizes of pipe and fittings conforming to the new standard would be available from that date on.

Municipal officials and others interested in the enforcement of plumbing codes and ordinances may now feel free to specify the new standard, because manufacturers can supply material conforming to it, and important government agencies have endorsed the use of such material.

Officials of municipalities that are considering its adoption may obtain copies of the standard (ASA: A40.1-1935, a 48 page pamphlet) from The American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y., or from the American Society of Sanitary Engineering.

New Picture Language, Dramatizing Statistics, To Have Dictionary

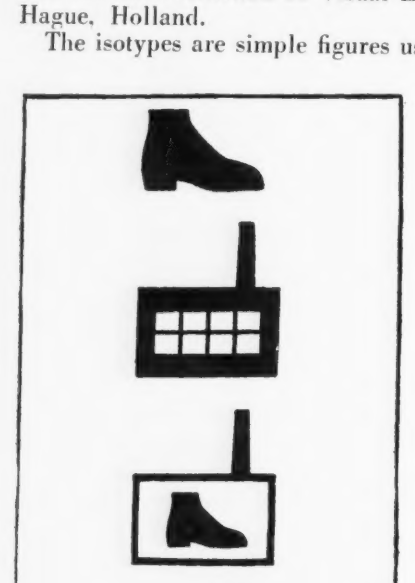
STANDARDIZATION of the new picture language—isotypes—is now recognized as essential to the continued success of the system as a simple, interesting, and readily understood method of presenting statistical facts and information. A dictionary which will help to eliminate the tendency to add individual touches when using the symbols is being prepared by a recently established International Foundation for the Promotion of Visual Education, The Hague, Holland.

The isotypes are simple figures used to replace words in presenting statistical facts and information of all kinds rapidly, correctly, and so they can be easily understood.

A shoe is represented by a silhouette; a factory is a rectangle with a chimney. The shoe placed in the rectangle means a "shoe factory." If smoke comes out of the chimney and the doors are open the factory is busy; if there is no smoke and the doors are closed the factory is idle. A pile of coins stands for "money." A letter superimposed on an airplane means "air mail."

A few words of explanation may be required with the figures. If the number of men in an army is being represented, it may be necessary to show for example, that "each figure stands for 20,000 men."

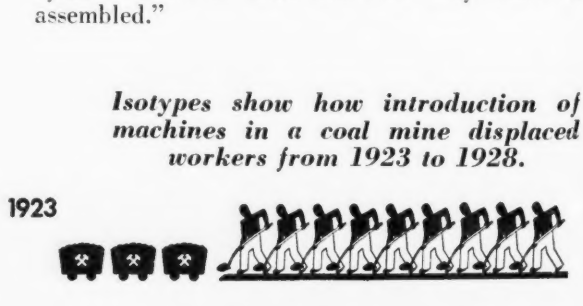
The creator of this sign language is Dr. Otto Neurath, social scientist and philosopher, who developed it in the Museum of Social and Economic Science at Vienna.



Widely Used

"Neurath's system of visual education is already in extensive use, especially in the United States," says Waldemar Kaempffert, writing in the *New York Times*, January 17. "But there is no consistency in the manner in which it is carried out and used. Each teacher, advertiser, illustrator, government bureau or business head modifies it in his own way, usually without realizing the necessity of obeying what is the equivalent of rules of spelling and grammar. There is need of standardization if an isotype chart is to have the same meaning for Frenchmen and Chinese—need of some authority to decide what symbols shall be used and how they shall be assembled."

Isotypes show how introduction of machines in a coal mine displaced workers from 1923 to 1928.



More Rigid Approval Requirements Increase Efficiency, Safety of Gas Appliances

Revised Requirements for Heating Appliances, Tubing and Fittings, Approved by American Standards Association; American Gas Association's Research Program Furnishes Data for Changes

236 Different Models of Space Heaters, 245 of Central-Heating Units, Tested and Approved by A.G.A. Last Year

by

Franklin R. Wright

American Gas Association
Testing Laboratories

STANDARDIZATION within the gas appliance industry has taken rapid and extensive strides within the last five years. Today 24 approval standards for gas appliances, listing requirements for gas appliance accessories, and installation standards for gas appliances and gas conversion burners are official American Standards. These requirements are now generally recognized, not only in this country and Canada but also throughout the world, as the most excellent engineering standards for consumer goods that have ever been developed. In many cases the current standards constitute the second, third, even the fifth and sixth revised editions which have been prepared in accordance with American Standards Association procedure and approved by the ASA.

The set-up and procedure of the American Gas Association, sponsor for all requirements on gas appliances, is such that gas appliance and accessory requirements are revised, expanded, and brought up to date on the average of about every two years. The work is carried on under the active supervision and guidance of the ASA Sectional Committee on Approval and Installation Requirements for Domestic Gas-Burning Appliances, Z21, A.G.A. Approval Requirements Committee, by some 38 standing subcommittees. Each subcommittee handles one type of gas appliance and accessory and is composed of experts in their respective fields. The total membership of all these committees is now 284, representing every section of the United States as well as the Dominion of Canada.

Approximately 50 meetings of these committees are held each year involving the expenditure of thousands of dollars on the part of the organizations represented, all in the interest of promoting the gas industry's self-imposed system of regulation in the public's interests. That this system is not only unique in the annals of business but also an outstanding success from the standpoint of producers, consumers, and utilities alike, is an established fact of which both the American Gas Association and the American Standards Association may be justly proud.

For a standardization program to be practical and generally acceptable, it must have the active support of every interested industry, organization, and element, and at the same time be suffi-

Members of Sectional Committee Z21, A.G.A. Approval Requirements Committee at committee's 39th meeting, A.G.A. Testing Laboratories, Cleveland.

Left to right: J. W. McNair, American Standards Association; B. B. Kahn, Estate Stove Co.; F. R. Wright, A.G.A. Testing Laboratories; H. E. G. Watson, The Consumers Gas Co., Toronto, Canada; W. S. Walker, Consolidated Edison Co. of New York; F. A. Lemke, Ruud Mfg. Co.; J. Mueller, Payne Furnace & Supply Co.; Katharine M. Ansley, American Home Economics Association; K. R. Knapp, A.G.A. Testing Laboratories; R. B. Harper, *Chairman*, Peoples Gas Light & Coke Co.; R. M. Conner, A.G.A. Testing Laboratories; G. W. Jones, U. S. Bureau of Mines; W. E. Derwent, Geo. D. Roper Corp.; G. M. Wile, Associated Factory Mutual Fire Insurance Cos.; R. H. Cutting, American Institute of Architects; L. B. Wilson, Consolidated Gas Electric Light & Power Co. of Baltimore; C. C. Winterstein, United Gas Improvement Co.; W. M. Couzens, A.G.A. Testing Laboratories.

ciently flexible to meet changing conditions and permit the development of new and revised standards as rapidly as conditions warrant. The success of the American Gas Association's undertaking in the standardization, testing, and certification of gas utilization equipment under American Standards Association procedure has been in a large measure due to such cooperation, flexibility, and expeditious development and revision of standards to meet changing conditions.

A staff of American Gas Association Testing Laboratories engineers has been continuously engaged for 11 years in conducting research and investigations for the various requirements committees. From 25 to 45 projects are completed and reported annually. Some of these are carried over from year to year, while others involve only a limited time for completion. Frequently, supplementary or original studies of a similar nature are also made by cooperating agencies such as the National Bureau of Standards. Many of the requirements committees are continuously engaged in revision, expansion, and modernization of the standards under their jurisdiction. In most cases by the time one edition of a set of requirements has been printed in final form another edition is under development, including therein requirements based on the latest developments in equipment and the newest concepts in the art of gas utilization.

On December 8 the sixth edition of the Approval Requirements for Gas Space Heaters, the fifth edition of the Approval Requirements for Central Heating Gas Appliances, and the second edition of the Listing Requirements for Semi-Rigid Gas Appliance Tubing and Fittings were officially approved as American Standard and each is now available in printed booklet form. The preceding editions of these were also given similar recognition and have been actively enforced by the American Gas Association Testing Laboratories since July 1, 1934, July 1, 1935, and January 1, 1936, respectively. The enforcement of prior editions of the two approval standards date back to 1925 for gas space heaters and 1927 for central-heating gas-appliance equipment—a decade or more of proven value—a record of standardization that has meant outstanding progress in these fields.

Gas Space Heater Standards

The American Standard Approval Requirements for Gas Space Heaters apply to many types of individual room heaters, including radiant heaters, warm-air circulators, gas, steam, and hot-water radiators, gas coal baskets, and gas logs.

The revised edition of the space-heater standards contains many additional construction and performance requirements, while several of the previous clauses and sections have been revised. Probably the most extensive changes are those to bring about complete correlation between these standards and the various American Standards for gas-appliance accessories. These accessory standards were completed after the preceding edition of the space-heater requirements was published. It is the established policy of the American Gas Association to require the same or equivalent construction and performance for the accessories used on appliances as is required of such accessories when they are examined for listing under the accessory standards.

Further, it is the policy of the American Standards Association to avoid conflict by correlating all the standards applying to similar equipment. Due to the inherent differences between approval requirements for gas appliances and listing requirements for gas-appliance accessories it is sometimes necessary to provide different test procedures for appliances and accessories. Every effort is made, however, to keep the substance of such requirements the same. A further discussion of this subject is given in a paper entitled "The Purposes and Development of Listing Requirements for Gas Appliance Accessories and Their Relation to Approval Requirements for Gas Appliances" by the author of this article, published in the December, 1934, issue of the *American Gas Association Monthly*.[2]

Under the new space-heater standards semi-rigid gas-appliance tubing and fittings, burner valves, automatic devices to prevent escape of unburned gas, and gas-pressure regulators are required to comply with the appropriate American Standard listing requirements. New requirements for draft hoods are included in the space-heater standards and are based on the American Standard Listing Requirements for Draft Hoods. Compliance of such accessories with the Listing Standards, however, exempts draft hoods from the application of the same tests under these standards.

Air shutters on Bunsen burners of the conventional type are now required, and provisions must be made to insure that such shutters shall be conveniently accessible for adjustment with the burners in place on the heater and with the appliance in operation. In addition, the minimum permissible thickness and weight of materials used for parts not previously specifically covered in the standards are now stipulated. In addition to the specific requirements, a general clause has been added to insure that the construction of parts not specifically mentioned shall be such as not to show signs of becoming so warped, bent, broken, or defective as to prevent the heater's continued compliance with the approval standards.

Add Accessory Tests

The performance requirements of the space-heater standards have been expanded by the addition of numerous tests on accessories and controls such as burner valves, thermostats, automatic devices to prevent escape of unburned gas, draft hoods, etc. In addition, many existing requirements have been clarified and extended. A requirement to insure adequate capacities of all controls on both manufactured and natural gases has been included and the test for fire hazard has

[2]Reprints of this paper may be secured from the American Gas Association Testing Laboratories, 1032 East 62nd Street, Cleveland, Ohio.

Testing the efficiency of a gas warm-air furnace at the American Gas Association's Testing Laboratories, Cleveland. Stringent tests for thermal efficiency of basement furnaces and fire hazards of floor furnaces are required by the standards.

The flexibility of semi-rigid tubing is tested by flattening and bending the metal tubing. The tubing is used to connect accessories on gas appliances, and to connect gas appliances and gas refrigerators to house piping.

been made more rigid. A new test on resistance of heaters provided with flue collars against resistance to chimney drafts is also stipulated. Figure 2 shows a warm air circulating type space heater undergoing a series of chimney draft tests.

Another important change in the performance section of these standards is an increase in the minimum thermal efficiency from 65 to 70 per cent for vented heaters of 20,000 Btu per hour and higher ratings. This change will mean greater economy in the operation of such heaters and is in line with the Association's policy of increasing the severity of the standards as rapidly as developments in the art will warrant. Unvented heaters are, of course, 100 per cent efficient since all of the heat liberated is discharged directly in the room where the appliance is situated.

Central-Heating Gas Appliances

American Standard Approval Requirements for Central-Heating Gas Appliances cover such equipment as gas-operated steam, vapor, and hot-water boilers, basement furnaces, and floor furnaces used for house-heating purposes. Unit heaters which are largely used for commercial heating and industrial gas boilers used principally for the operation of pressing machines and similar purposes are covered under separate American Standards.

Tremendous strides have been made within the last few years in the development and perfection of central house-heating gas-appliance equipment. The beauty and convenience of modern gas boilers and furnaces have made of them the aristocrats in the domestic heating field. Improvements in economy of operation and reduced costs through standardization and greater production, coupled with steady reductions in gas rates, have brought their use within the means of practically everyone.

New Provisions

The new edition of the American Standard Approval Requirements for Central Heating Gas Appliances contains many new provisions, the greater number involving further correlation of these requirements with the various Listing Standards for gas-appliance accessories. Semi-rigid gas-appliance tubing and fittings, automatic devices designed to prevent escape of unburned gas, gas-pressure regulators, electric gas-control valves and diaphragm valves used on approved gas boilers and furnaces must now comply with the construction requirements specified in the listing standards. In addition, that section of the requirements applying to draft hoods has been fully correlated with the American Standard for such devices.

Hot-water boilers must, under the revised standards, be provided with effective devices to prevent water temperatures from exceeding 239 degrees Fahrenheit, while the maximum permissible gas rate to pilots on both boilers and furnaces has been reduced from 10 to 5 feet of gas per hour. This should tend to increase the economy of operation of such equipment.

One of the other important changes relates to the use of automatic devices to prevent escape of unburned gas. All approved boilers and basement furnaces are now required to be equipped with such controls. In addition, the use of these devices is now specified for automatically or remotely controlled floor furnaces.

Of like importance is the provision making the use of gas-pressure regulators mandatory on all floor furnaces in addition to basement furnaces and boilers. In applying these provisions to the testing and approval of appliances, the requirements for gas-pressure regulators and automatic devices to prevent escape of unburned gas have been made retroactive to apply to all boilers and furnaces regardless of the original approval date of such equipment.

In addition to many minor changes and improvements in sections of the requirements apply-

ing to burner valves, main control valves, pilots, and relief valves, new construction requirements prohibit the use of dampers for closing the warm-air outlet from floor furnaces having a single warm-air register and limit the amount of closure where two or more outlet registers are provided. Fan furnace limit controls are now required, which will shut off the main gas supply when the temperature of the warm air in the furnace bonnet reaches 200 degrees Fahrenheit. When it is considered that gas furnaces now are generally designed to operate with warm-air temperatures of around 150 and 180 degrees Fahrenheit under normal conditions, the extreme precision required in the design and application of controls will be apparent.

Tests for fire hazard on floor furnaces have been made more rigid, and more stringent tests for thermal efficiency of basement furnaces have been added in the requirements on furnaces. Figure 3 shows a modern gas furnace undergoing an efficiency test at the Testing Laboratories of the American Gas Association.

Revised Standards for Semi-Rigid Gas Tubing and Fittings

The new listing requirements for semi-rigid gas-appliance tubing and fittings are far more specific in regard to permissible types than the present standards. Both compression and flared fittings are acceptable under the requirements, but in connecting gas appliances to house piping the use of the flared type, only, is recommended.

The appendix in this booklet contains several tables, taken directly from the 1935 *S.A.E. Handbook* through the courtesy of the Society of Automotive Engineers, showing acceptable dimensions for all approved fittings on semi-rigid tubing. It is specified that all pipe threads on fittings must be in accordance with the American Standard for Pipe Threads, B2-1919, while the nuts and screws of the fittings must be made with S.A.E. Standard Threads, Fine Series, Class 2 Fit. The present standards list the allowable tolerances in diameter, wall thickness, and chemical purity of the metal tubing of various sizes as well as required performance in regard to strength, flexibility, endurance, durability at high temperatures, cracking, corrosion, and ductility. Figure 4 shows an engineer at the Testing Laboratories of the American Gas Association in Cleveland conducting tests on samples of semi-rigid tubing.

A new performance test of considerable importance in assuring that there is no leakage of a tubing assembly has been developed and introduced. In this reconnection test, the tubing is bent at the fitting, straightened, disconnected, and reassembled; the tubing and fitting must still be gas tight, after performing this series of operations five times. Since there is small chance of any fitting being disconnected and reconnected five times during the life of an appliance, the test, it is believed, contains an ample safety factor.

The chief use of semi-rigid tubing in the gas industry in the past has been for connecting accessories on gas appliances. A recent, rapidly developing field for metal tubing, however, is in connecting appliances to house piping. This practice is popular in the South and Southwest for installing space heaters which are required during only a few months of the winter. Extensive use of such tubing is also made in connecting gas refrigerators to house piping.

Standards Cover Wide Field

The latest issue of the *Directory of Approved Gas Appliances and Listed Accessories,* which is published by the American Gas Association Testing Laboratories, catalogues the names of 180 firms who produce equipment complying with the present forms of the standards mentioned. During the last fiscal year of the Testing Laboratories, 336 different models of space heaters were tested and approved as well as 245 central-heating units.

Appliance manufacturing concerns are now building thousands of heaters, boilers, and furnaces for the markets in exact accordance with the American Standards for these tested models. Each certified product sold in the United States bears the Seal of Approval of the American Gas Association Testing Laboratories, while in Canada the Approval Seal of the Canadian Gas Association is attached to appliances on the basis of satisfactory test results at the American Gas Association Testing Laboratories.

The success of this program of standardization, which is chiefly concerned with consumer goods, is demonstrated by the fact that approximately 95 per cent of the two and a half million gas appliances sold annually in the United States and Canada are now approved as conforming with American Standards and bear the Seal of Approval of the American Gas Association.

New Underwriters' Standard For Extinguisher Systems

A new edition of its regulations for Foam Extinguisher Systems has been published by the National Board of Fire Underwriters. Copies are available from the N.B.F.U., 85 John Street, New York. The new edition incorporates changes recommended by the Committee on Manufacturing Hazards and adopted by the National Fire Protection Association at its 1935 and 1936 annual meetings.

Irwin Elected President By Railway Engineers

J. C. IRWIN, valuation engineer, Boston and Albany Railroad, past-chairman of the Standards Council of the American Standards Association, was elected president of the American Railway Engineering Association at its 38th Annual Convention, Chicago, March 16-18.

Mr. Irwin succeeds A. R. Wilson, Engineer of Bridges and Buildings, Pennsylvania Railroad, also a member of the ASA Standards Council.

The growing interest of railroad engineers in research and the relation of standardization to the research program was emphasized in the address of the retiring president, as well as in the reports of the committees, presented during the convention.

The committee on standardization presented a list of 106 standard specifications which it is urging for adoption on all railways in the interest of efficiency and economy. Included in this list are specifications affecting roadway ballast, ties, track sections, railway buildings, wood bridges, and iron and steel structures, masonry, highways, water service protection, sanitation, yards, and terminals, work equipment, and uniform general contract forms.

Progress in national standardization, in cooperation with the American Standards Association, has been made in several fields, the committee reported. The Recommended Standards for Railroad-Highway Grade Crossing Protection were presented to the ASA and were approved as American Standards, and the Board of Direction of the A.R.E.A. voted to present the A.R.E.A. specifications for the manufacture and installation of motor-truck built-in self-contained and portable scales for railway service—1936, to the ASA for approval.

ASA Approves Standard

The Committee on Highways has been working in cooperation with the American Society of Municipal Engineers and the American Transit Association on the development of design and specifications for highway grade crossings over both steam and electric railway tracks. Detailed specifications for concrete slab crossings, proposed by this committee, were adopted by the Association. The highway committee is carrying on studies, which have not yet been completed, on economic aspects of grade crossing protection in lieu of grade separation, comparative merits of grade crossing protection, and methods of classifying grade crossings with respect to hazard.

Six drawings for crossing signs to be suspended over a highway, presented by the Committee on Highways, were approved for inclusion in the A.R.E.A. Manual. The committee reported that at highway-railroad grade crossings, where, because of local conditions it is not practical to place the crossing sign on a post, the sign may be suspended. The drawings show the recommended method of mounting the 90-deg railroad-crossing signs. The committee is also working on "Gates-Not-Working" and "Watchman-Not-on-Duty" signs.

Permit Welding in Bridges

In its report presented at the convention, the Committee on Iron and Steel Structures recommended adoption of specifications to permit welding in steel bridges, but suggested additional research to provide more complete information on the behavior of welds subject to stress.

New specifications for stone ballast in lieu of those adopted in 1931 were presented by the Committee on Ballast and adopted by the A.R.E.A. Changes were also approved in the specifications for prepared blast furnace slag ballast.

On recommendation of the Committee on Masonry, specifications for the design and construction of rigid-frame concrete bridges were adopted.

The Committee on Ties, basing its report on observations on approximately 1,100,000 crossties at four different wood-preserving plants, reported that the greatest ultimate economy in the use of ties is obtained by the A.R.E.A. standard specifications, (American Standard O3-1926). This policy best serves the interests of both producer and consumer, the committee reported.

Three Groups Join ASA As Associate Members

Three associations have taken out associate-memberships in the American Standards Association during the past month. The National Elevator Manufacturing Industry, Inc., the Brick Manufacturers Association of America, and the Brick Manufacturers Association of New York are now entitled to services available through this type of membership.

These services include use of the American Standards Association Library with its 20,000 standards and related material, subscriptions to INDUSTRIAL STANDARDIZATION, and one free copy of newly approved standards.

American Practice Influences Australian Standard for Bolts

THE use of American bolts and nuts in Australia has influenced the Standards Association of Australia to propose a draft standard for dimensions of black iron and steep cup and countersunk bolt heads differing from the approved British Standard. Although it is the policy of the Australian standardization body to use British Standards without change wherever possible, in this case, the Association reports, 90 per cent of the bolts used conform to the American size and style rather than the British.

"The standard adopted in Great Britain for hexagon and square head black bolts is the Whitworth Standard (See B.S.S. No. 28)," says the Preface to the proposed standard, in explaining the reasons for the variation from the British specifications. "For several other types of bolts, such as cup heads, a standard for dimensions of the head has also been established (see B.S.S. No. 325).

"The Whitworth standard for bolt heads was originally set up many years ago and has not been changed. It is not proposed to discuss the past merits of the particular dimensions in this standard, but it is believed that most bolt manufacturers will now agree that under modern conditions adherence to the Whitworth Standard involves a forged head, one of which contains unnecessary metal, and one whose strength is in excess of the strength of the shank of the bolt at the root diameter of the thread.

"The Australian manufacturers admit that as regards hexagon and square head bolts the widths across flats must be adhered to, while Whitworth spanner sizes continue in general use, but they contend that other dimensions can with advantage be varied immediately.

Use American Bolts

"In many classes of bolts (where no spanner is required on the head—tire bolts, plow bolts, cup head—1/4 in., 5/16 in. and 3/8 in. diameter, etc.) the Australian market, before the advent of local production, was held by the American manufacturers, with the result that the Australian users of bolts have become educated to, and adapted themselves to the American type of head. As no spanner is used on the heads of these bolts, the only considerations are strength and suitability of shape.

"The heads adopted as trade standards in this country, and now embodied in this draft specification have ample strength, under tensile test, to break the bolt shank at the root diameter of the thread, and are flatter and neater than the British standard."

A copy of the proposed Australian standard (No. B 59) may be borrowed from the American Standards Association.

Measure Children For Clothes Sizes

Sizes of children's garments may be determined scientifically if a project just started under the leadership of the Bureau of Home Economics, U. S. Department of Agriculture, reaches a successful conclusion. A study of body measurements of 100,000 children between the ages of one and fourteen is being made under the direction of the Bureau with the cooperation of the National Youth administration and colleges and universities interested in home economics problems.

A committee on which pattern and garment manufacturers, retailers, and independent experts will cooperate is now being organized to assist the Bureau. Preliminary meetings have already been held and details of the program are being arranged.

The Advisory Committee on Ultimate Consumer Goods of the American Standards Association has already endorsed the proposed project, and has recommended that, because this work may lead to recognized national standards, the committee being organized by the Bureau might well serve as a sectional committee of the ASA.

Dry Cells and Batteries Standard Now For Sale

The American Standard Specification for Dry Cells and Batteries (C18-1937) recently revised under the administrative direction of the National Bureau of Standards has now been published by the American Standards Association. The standards were described in an article by G. W. Vinal, Industrial Standardization, February. Copies are available at 15 cents each.

Control of R
Centers in S

A FEW years ago protection of a highway at a railroad grade crossing involved the use of a crossing sign only, or in special cases a bell to indicate the approach of a train. Highway traffic was limited to horse drawn vehicles, and the speed of trains and their frequency was far less than obtains at the present day. The "Stop-Look-Listen" message carried by the sign post was generally observed, and accidents due to trains striking vehicles, or due to the latter running into the side of trains were practically unknown.

Three conditions, two of them closely related, served greatly to alter the matter of protection required. These were the development of the automobile for commercial and recreational purposes, the installation of hard-surfaced highways, and the increasing speed and frequency of trains. Obviously the two former influenced the situation to a much greater extent than the latter.

During 1921 there occurred at railroad-highway crossings 1,705 fatalities and 4,868 injuries to persons, a total of 6,573 casualties. Of these casualties 5,287, or 80.4 percent, involved automobiles, of which there were then 10,465,995 registered in the United States.

The peak in railroad-highway crossing fatalities was reached in 1928 when 2,568 persons were killed and 6,666 injured, a total of 9,234 casualties, 90.8 percent of which involved automotive vehicles, there being 24,493,000 registered.

In 1935 railroad-highway crossing fatalities fell to 1,680 and injuries 4,658, a total of 6,338 casualties. Of these casualties 92.7 percent involved automotive vehicles, there being 26,167,000 such vehicles registered.

Reduce Casualties

It will be seen that notwithstanding the vast increase in motor vehicles in operation, and recalling the dismaying growth of highway motor car fatalities which, in 1936, reached the enor-

# of Railroad-Highway Accidents in Standard Crossing Signals

Elimination of Crossings and Education of Public Round Out Accident-Prevention Program

American Standards Association, Approving Standard, Finds All Groups Concerned Accept It

by

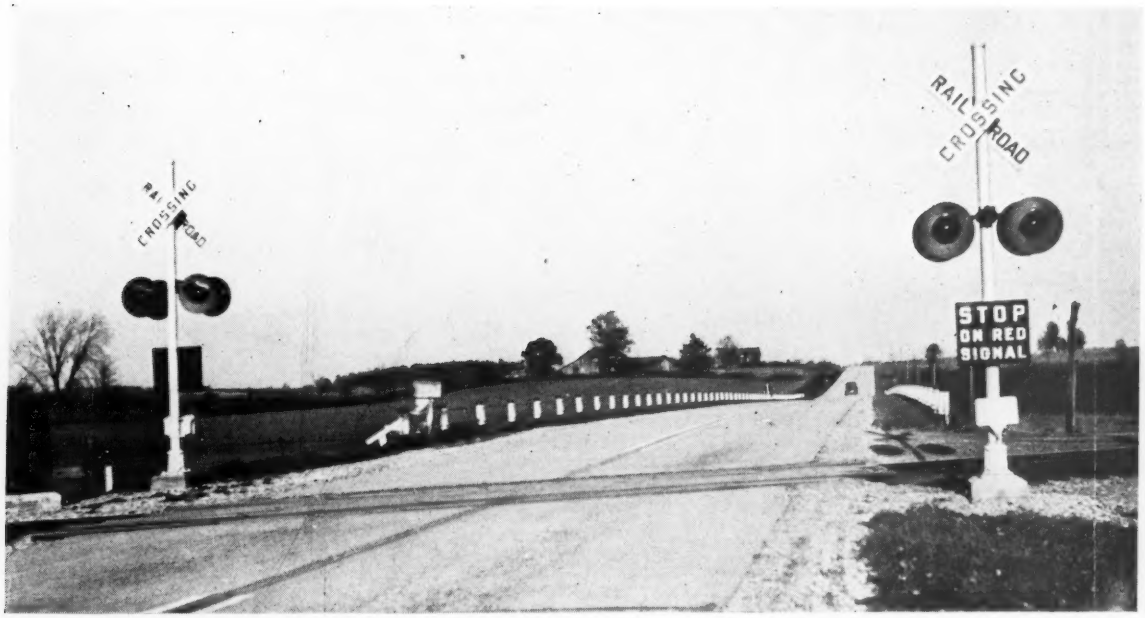
L. C. Heilman

Secretary, Joint Committee on Grade Crossing Protection, Association of American Railroads

mous total of 38,500, yet the railroad-highway crossing casualties were substantially decreased, that is to say, the reduction of fatalities was 34 percent and of injuries 30 percent from the peak year.

Three remedies for alleviating the conditions pictured in the statistics presented are elimination of crossings, standardization of protective devices, and education of the public. The gratifying results are due in a great measure to the energetic cooperation of the several branches of railroad management and employes, of the various governmental agencies concerned, of the press, the motor driving public, and others who

Standard signals are easily recognized as danger warnings



33 States Adopt Standard Signals

Seventeen state regulatory bodies have prescribed the use of the standard flashing light or wigwag crossing signal, and 16 others have approved these signals for protection of railroad-highway grade crossings in their states.

The American Standard for Railroad Highway Grade Crossing Protection (D8) was developed by the Joint Committee on Grade Crossing Protection of the Association of American Railroads.

Its requirements are consistent with the recommendations of the American Standard Manual on Uniform Traffic Control Devices for Streets and Highways (D6-1935) and directly refers to the provisions of the Manual.

It has been endorsed by the National Conference on Street and Highway Safety, and has been adopted by the U. S. Bureau of Public Roads.

have in manifold ways carried on the good work of crossing accident prevention.

In 1922 the Safety Section, Association of American Railroads, organized, as an educational medium, its Committee on Prevention of Highway Crossing Accidents. That Committee established the Careful Crossing Campaign, calling the attention of railroad management, employes, and the general public to the hazards of railroad-highway crossings, and devised ways and means to lessen the occurrence of mishaps at such places.

Probably 95 percent of all railroad-highway crossing accidents could be prevented by strictly following very simple advice.

When approaching railroad crossings *LOOK* and *LISTEN* with the intention of seeing and hearing.

If there be the slightest possibility a train may come upon one: stop in a safe place. Do not go until all tracks are cleared.

When sure of your safety, proceed promptly.

All of this is epitomized in CROSS CROSSINGS CAUTIOUSLY.

Crossing Elimination Ideal

It is self-evident that the ideal safeguard would be the elimination of crossings by the separation of the grades of the railroad and the highway. The cost of this method, however, even for the more important crossings, caused those interested in the problem to seek other solutions, and the most practical alternative seemed to be protection. With this thought in mind inventors and manufacturers began to develop signs and signals for the purpose, presenting a variety of aspects to the highway traveler, and utilizing a more or less complicated mechanism for their operation.

Safety in Standard

It soon became apparent to the railroads that the maximum protection could not be secured by the use of many different signals to present to the highway traveler the fact that a train was approaching the crossing. This same thought of uniformity caused highway and traffic engineers to develop warning and directional signs, that carried the same meaning wherever encountered, and which were used for no other purpose.

To carry out this idea with respect to railroad-highway grade crossing protection, the Association of American Railroads organized its Joint Committee on Grade Crossing Protection in April, 1930, to investigate and develop uniform methods for, and to cooperate with other bodies interested in the subject of grade-crossing protection. The membership of the committee is composed of representatives of the Operating and Engineering branches of railroad work, so that the point of view might not be centered along any one line of thought. The personnel is also selected geographically to cover the entire country, in order that a nationwide opinion could be secured before deciding upon the matters presented for consideration.

The early deliberations of the Joint Committee established certain principles to be followed, among which are the following:

(1). The signs and signals shall be distinctive in aspect.

(2). The manner of presenting the indication shall be used for no other purpose.

(3). The apparatus shall be as simple as possible to perform its intended function.

In carrying out these ideas, the commonly known traffic control "Stop and Go" signal was immediately removed from consideration as a train approach signal. That this opinion is generally accepted is adequately shown by the following quotation taken from the Manual on Uniform Traffic Control Devices for Streets and Highways (D6-1935), approved as American Standard by the American Standards Association.

"*Section 325—Traffic Control Signals in Lieu of Train Approach Signals at Railroad Grade Crossings.*

"Traffic control signals shall not generally be

used as alternatives to train approach signals except where streets intersect at or close to the railroad crossing, and then only where observance is enforced by police authority. When used, both sides of the track shall be adequately protected by signal faces."

Two Types Used

It was found that two general types of signals were in use, the flashing light and the wigwag. The former was most generally used in the eastern section of the country, and the latter in the western portion. As each had its following, it was decided to propose a standard form of each, as the aspect is essentially the same, that is, the appearance of a horizontally moving red light. In one case this is presented by alternate flashes, and in the other by a light on a swinging disc. The signals and details necessary are illustrated in Bulletin No. 2—Railroad Highway Grade Crossing Protection — Recommended Standards, published by the Joint Committee on Grade Crossing Protection of the Association of American Railroads, dated July, 1935.

The extent of the acceptance of the standards and practices recommended for the purpose is indicated by the fact that the following organizations, national in character, have endorsed and approved them.

Bureau of Public Roads—United States Department of Agriculture.
National Association of Railroad and Utilities Commissioners.
American Association of State Highway Officials.
National Conference on Street and Highway Safety.
American Automobile Association.

The states shown below have either by formal action, or by formal approval, recognized the standards for use within their jurisdiction:

States in Which A.A.R. Flashing Light or Wigwag Crossing Signal Protection is Prescribed by Formal Action of Regulatory Body

California[1]	Missouri[4]
Colorado	New Hampshire[5]
Connecticut[2]	New York
Illinois	Oregon
Iowa	Pennsylvania
Louisiana	Rhode Island[2]
Michigan[3]	Utah
Minnesota[1]	Vermont[2]
Wisconsin[1]	

[1]Rotating stop sign required.
[2]General order to one railroad.
[3]Prescribed by state law.
[4]Except lettering on crossbuck.
[5]Auxiliary signs not required.

States in Which A.A.R. Flashing Light or Wigwag Crossing Signal Protection is Approved by Regulatory Body

Arkansas	New Jersey
Indiana	North Carolina
Kansas	Ohio
Maine	Oklahoma
Massachusetts	South Dakota[1]
Montana	Texas
Nebraska	Virginia
Nevada	Washington

[1]Rotating stop sign favored.

Practically all states, however, permit their use whether installed by the railroads or by federal appropriation.

In practically all cases where prescribed by formal action of the regulatory body, this action was taken after the approval of the railroads of the state was secured. The adoption therefore was the result of a suggestion made by the Joint Committee, supported by the railroads, rather than by any action wholly by the state itself.

Provide for Progress

It is obvious that there must be development and progress in the design of protective devices and apparatus of this type, and the Joint Committee on Grade Crossing Protection is constantly alert to discover new methods that have merit for the purpose. For this reason it is expected that the standards will be revised at intervals in order to keep pace with new ideas that may enter the field.

Retail Dry Goods Association Becomes ASA Member-Body

The National Retail Dry Goods Association, representing more than 5,700 retail stores throughout the country, has just affiliated with the ASA as a Member-Body.

Long noted for its leadership in the development and solution of distribution problems, the N.R.D.G.A. is now taking a more active part in cooperation with consumer and governmental groups in the development of standards. It is a member of the Advisory Committee on Ultimate Consumer Goods, organized by the American Standards Association to supervise standardization efforts in the field of consumer goods.

Membership on the Standards Council, one of the privileges of an ASA Member-Body, will enable the N.R.D.G.A. to keep in touch more effectively with the administration of standardization problems.

Explorers Also Need Standards

STANDARDIZATION is an important factor in the most exciting and spectacular research adventures as well as in mass-production on the assembly line, but management needs stimulation to recognize its full significance, according to Dr. John Gaillard, mechanical engineer of the American Standards Association and newly elected vice-president in charge of standardization of the Society for the Advancement of Management. Writing in the April issue of the Society's *News Bulletin*, Dr. Gaillard says:

"The Society's new division on Standardization has a real sales job on its hands. Standardization may be a main function of scientific management, but to many executives it is not one of the most attractive. Human nature resents restriction of liberty. We know that system is needed, but we dislike regimentation. And it is often a matter of opinion where the dividing line between the two lies.

Uniformity False Impression

"With some people, standardization unduly creates the impression of excessive uniformity of their company's product, with resulting decreased appeal to the customer. Or, of an effort to treat personnel problems with disregard of the human touch. Another widespread misconception is that standardization, indispensable for large companies engaged in 'mass production', cannot be successfully applied in small concerns or in those whose product varies considerably.

"Similar misconceptions exist about other functions of management. On standardization, they weigh probably somewhat heavier than, say, on research which has the character of exploration and, hence, of adventure. The film of Byrd's South Pole flight thrilled thousands by its almost palpable sensation of danger. Did movie goers realize what standardization had contributed to make the flight possible? Very likely not. Yet, this showed even in such simple matters as a man, blueprint in hand, removing a box of canned food from a tunnel wall between the buildings of Little America and replacing it by an empty box. A homely detail, if you will. But the culminating success of 'heroic' acts depends largely on thousands of such standardized practices.

"Designed to serve as the mental labor-saving equipment of executive management, standardization can be hand-tooled to the individual needs of each company, whether it makes candy or locomotives. Often, the only practical way of 'selling' standardization may be to show the dollars and cents value of its application to purely technical problems. The Westinghouse Company saved $25,000 a year simply by standardizing on 150 washers, instead of having 1,350 different kinds. Why, then, cannot the XYZ company save a lot of money by standardization—if it only reviews its possibilities?

Saves Executive Energy

"Well-directed standardization can do much more than to make savings on 'technical' items. An incalculable amount of high-priced executive skill, energy and time can be released by relegating all standardizable matters to routine. And this affects the very task of executive management consisting in the fitting together of various performances, or in other words: the proper coordination of individual and departmental functions through effective cooperation.

"Frank B. Gilbreth has said: 'Cooperation without standardization is a most unstable thing, likely to disappear at any moment with a change in the individuals supposed to cooperate.' Industrial management may well take these words to heart. Standardization is a good investment—why not have more of it?"

ASA Committee Recommends Building Code Arrangement

The Building Code Correlating Committee has recently adopted a recommended arrangement of chapters customarily included in building codes. This arrangement is intended to serve as a guide to sectional committees in the development of detailed building code provisions.

To supplement the arrangement of chapters, section headings and topics customarily included in the various chapters have also been prepared. This material is in tentative form to assist committees in the preparation of material for inclusion in the various chapters.

Municipal officials and others interested in developing or revising building codes may find this material helpful.

Copies may be obtained from the ASA office.

Standard Loading Platforms Proposed as ASA Project

Standard heights for loading platforms at freight terminals, to eliminate variations which now increase the expense of handling freight, will be developed under the procedure of the American Standards Association, if the recommendations of a general conference held on March 19 are approved by the ASA Standards Council.

Difficulties in loading and unloading freight due to different heights of railroad car and truck floors, as well as different heights of freight loading platforms, brought together a committee of wide interests to decide upon recommendations to the ASA. Organizations whose representatives attended the meeting are:

American Society of Mechanical Engineers
Society of Terminal Engineers
American Trucking Associations, Inc.
Association of American Railroads
National Industrial Traffic League
American Warehousemen's Association
Automobile Manufacturers' Association
Society of Automotive Engineers
Armour and Company

The conference was called by the American Standards Association following a joint request from the American Society of Mechanical Engineers and the Society of Terminal Engineers to have the problem taken up under ASA auspices.

Recommends ASA Committee

The conference recommended that a sectional committee should be organized under American Standards Association auspices to undertake standardization of the height and other dimensions of loading platforms, in connection with the handling of freight to and from railway cars, and to and from highway vehicles. It also recommended that such a project should include height of loading platforms to accommodate various classes of railroad cars and highway vehicles in relation to rail level and street or yard level; distance from track center to edge of loading platform; and vertical and horizontal clearances for highway vehicles.

The conference suggested that the Society of Terminal Engineers and the American Trucking Association be invited to accept joint leadership for the proposed project.

In presenting the request for the organization of work on this standardization problem, the American Society of Mechanical Engineers and the Society of Terminal Engineers called attention to recommendations made in 1934 by a joint A.S.M.E.—S.T.E. committee. Technical developments since that time and the fact that several new organizations have become interested in the problem make it desirable to continue the work now, they said. It is the intention that these new organizations, as well as the members of the original joint committee, will be invited to cooperate in the new project.

The recommendations of the general conference are being submitted to the Standards Council of the American Standards Association for approval.

NEMA Publishes Three New Standards

New Power Switchboard Standards, Oil Circuit Breaker Standards, and Attachment Plug Standards have just been published and released by the National Electrical Manufacturers Association.

All information available on the manufacture, test, and performance of oil circuit breakers and power switchboards is given in these two standards, which supersede the N.E.M.A. Switchgear Standards released in 1931. The attachment plug standards cover the manufacture and test of attachment plug caps, bodies, and receptacles.

Copies of the publications may be obtained from the National Electrical Manufacturers Association, 155 East 44th Street, New York. Prices are: NEMA Power Switchboard Standards $1.10 a copy; NEMA Oil Circuit Breaker Standards 90 cents; and NEMA Attachment Plug Standards 25 cents.

Australian Association Issues Sheet Standards

Materials for bed sheets, draw sheets, and pillow slips are covered in standard specifications prepared recently by the Standards Association of Australia. Copies have just been received by the Library of the American Standards Association, and may be borrowed.

Minimum requirements for the materials and tensile strength and shrinkage tests are given.

Is Grounding of Electric Circuits On Piping Systems Good Practice?

by

Charles F. Meyerherm

Secretary, American Research Committee on Grounding

Questions presented to American Standards Association start work by Research Committee

Intensive program will determine effect of grounding on pipes and pipe contents, safety, and efficiency

American Water Works Association and Edison Electric Institute direct committee's work

THE appointment by the American Research Committee on Grounding of a new technical subcommittee to thoroughly investigate the effect of grounding electric wires on piping systems brings to a head a controversial question which has been developing for years, and may eventually lead to important changes in requirements of the National Electrical Code.

The question of grounding electric light and power circuits has received attention almost from the beginning of the use of electricity for light and power. In the early days it was considered necessary to keep the circuits on customers' premises entirely free from ground. However, with the introduction of alternating current and the use of 2200-volt primary distribution, there was a trend toward the grounding of secondary distribution circuits with the idea that such grounding would limit the voltage on the secondary circuit to a safe value in case of accidental contact between primary and secondary wires. For many years there was considerable debate as to the desirability of such a practice but gradually there was a marked swing in favor of grounding secondary distribution circuits.

Secondary Grounding Mandatory

The National Electrical Code as early as 1901 permitted the grounding of secondary circuits. In 1903 the Code recommended that such circuits be grounded. It was not until 1913, however, that the rule was made mandatory. At the present time such grounding is specified also in the National Electrical Safety Code and in practically all city or state electrical codes where such exist.

Ordinarily, the most effective grounding electrode available on a consumer's premises is a continuous metallic underground water-piping system. The reason why such a water-piping system makes the best ground is not because the pipes have water in them but is because such a piping system has a large contact surface with the conducting material of the earth. Furthermore, water pipes appear at numerous points throughout the house and are interconnected or in contact with steam pipes, gas pipes, etc., so that collectively these pipes offer numerous chances for people to make contact with them. If the water pipe is used as a grounding electrode, there is little likelihood that persons in the premises will be

Many Interests Join In Research Program

The American Research Committee on Grounding has started its broad research program on one of the most widely accepted electrical practices of the day by appointing a technical subcommittee to make field investigations and technical studies as a basis for its recommendations.

The effect of electrical current flowing through water, gas, or drainage pipes used for grounding electric light and power circuits will be studied from several different viewpoints. The effect of the current on the pipes, on the contents of pipes, and the possibility of fire and personal hazard will be studied. Investigations will be carried on to determine what conditions in the electrical circuits produce the current flow over the pipes; and measurement of stray currents will also be studied. An effort will be made to determine whether electrical grounding on piping systems is efficient and if so to what extent.

The American Research Committee has a membership of organizations vitally concerned with the problem of grounding electric light and power circuits. It was organized as the result of questions raised in the American Standards Association to make a study of grounding problems as a basis for possible changes in standard grounding requirements. It is operating under the joint auspices of the American Water Works Association and the Edison Electric Institute.

The organizations participating in the work of the committee are:

American Gas Association
American Institute of Electrical Engineers
American Society of Sanitary Engineering
American Standards Association, Telephone Group
American Transit Association
American Water Works Association
Copper and Brass Research Association
Edison Electric Institute
International Association of Electrical Inspectors
National Association of Master Plumbers
National Board of Fire Underwriters
National Bureau of Standards
National Fire Protection Association
New England Water Works Association

H. S. Warren, Bell Telephone Laboratories, New York, is chairman of the committee.

subjected to differences of potential since all the metallic objects such as radiators, pipes, conduits and the like will be held at substantially the same potential, which will not be the case if a separate and independent grounding electrode is used for the electric light circuit. The use of the water pipe for grounding also has economic advantages because in many locations the cost of obtaining an effective grounding connection by any other means would be very expensive. As a result it is now the almost universal practice to use water pipes, where they are available, as a grounding electrode for protective purposes. Such use of water pipes is not limited to electric light and power circuits but also applies to telephone, radio, lightning rods, etc.

Corrosion Trouble

At first, many water purveyors objected to the use of water pipes for the grounding of alternating secondary distribution circuits. They had experienced considerable corrosion trouble from direct current on their pipes and therefore hesitated to permit connections which might introduce alternating currents on their piping systems.

The question was extensively discussed for several years. In these discussions it was brought out that (1) protective grounding to water piping systems, where such were available, constituted the only effective practical safeguard to life and property and that (2) such connections would carry appreciable current only during short and comparatively infrequent periods when abnormal disturbances of the electric system caused these ground connections to fulfill their protective purposes. On such a basis, the American Water Works Association in 1920 adopted a resolution approving the grounding of secondaries of lighting transformers on water pipes for protective purposes.

As the practice of grounding secondary circuits became extensively introduced, water purveyors from time to time received complaints that their customers or employees received shocks from water pipes and that electric sparks occurred between disconnected ends of water pipes when meters were removed or reset. In certain situa-

tions the use of multiple grounds on the same secondary circuit short-circuited insulating joints in water pipes, thereby nullifying the value of such joints as protection against corrosion.

Lack Information

Unfortunately, in the case of most of these complaints, complete information is lacking. Such investigations as have been made indicate that many of the troubles were due to irregular conditions or to practices in violation of the National Electrical Code. The difficulty water purveyors have experienced in having irregular conditions corrected where grounding connections carried excessive currents has been accentuated by the fact that the wiring on the premises is controlled by the customer. The situation was further complicated by the growing practice of water works operators in using non-metallic jointing materials for cast-iron mains, which interrupts the metallic continuity of the water mains.

In 1927 the American Water Works Association adopted a resolution which, while still recognizing protective grounds to water pipes, specified that there must ordinarily be no appreciable current over the grounding connections. In line with this resolution, the National Electrical Code now provides that where an objectionable flow of current occurs over a grounding conductor due to the use of multiple grounds, one or more such grounds shall be abandoned or other means employed to limit the current. In the view of some of the water purveyors, however, this new requirement against objectionable current did not appreciably improve the situation since there is ordinarily no practicable way of determining whether or not there is an objectionable current, until some such effect as a shock or a spark is experienced.

Receive Complaints

In recent years there have also been complaints of objectionable odor, taste, color, or sediment in water, which could not be accounted for or remedied by accepted water works methods. This type of trouble has apparently been confined to one or a few houses in a given locality. In a number of such situations the only apparent difference between locations having trouble and locations having no trouble was that there were currents on the service pipes in the one location and not in the other. In other situations the trouble seemed to be due to current traversing a considerable length of house piping. In some cases it was reported that the trouble disappeared when electric power or radio grounds were removed from the pipes. These experiences naturally led the water purveyors to suspect that results harmful to them were occasioned by present grounding practices. The situation was complicated by the fact that in many of these cases the wiring was not in accordance with the National Electrical Code.

In attempting to get a more satisfactory explanation of these difficulties, several water works purveyors spent considerable time and money in research and detailed study of the problem. The results were not conclusive, however, particularly in so far as the actual physics of the phenomena was concerned, and it became evident that the problem was too large for individual water companies or departments to solve.

In May, 1935, the matter was brought to a head because the American Water Works Association rescinded its previous official sanction of grounding electric light and power circuits on water pipes. Shortly thereafter, the Association entered formal protest with the American Standards Association against adoption of the 1935 edition of the National Electrical Code as an American Standard. After a consultative review of this problem, this formal protest was withdrawn, on the understanding that a joint committee would be formed to make a cooperative study of this problem. Under the joint auspices of the American Water Works Association and the Edison Electric Institute, such a committee has been organized under the chairmanship of H. S. Warren, Bell Telephone Laboratories, New York.

Outlines Work

At the first meeting of the Committee the following resolution setting forth the Committee's objectives was adopted:

> **"To investigate and report upon, as conclusively as may be: (*a*) electrical grounding connections, made to water, gas, or drainage pipes, with respect to the effects of any kinds of electrical current thereby caused to flow, upon (1) the pipes, (2) the contents of the pipes, and (3) fire and personal hazards; (*b*) conditions in the electrical circuits involved which produce current flow over pipes; (*c*) measurement of stray currents; (*d*) efficiency of electrical grounding."**

The committee has appointed a technical subcommittee to make field investigations and technical studies necessary for a thorough review of this subject. This subcommittee will examine all available information, determine the pertinent physical facts and report to the committee its findings, from which it is hoped an engineering solution of this problem acceptable to all parties may be developed.

American Standard Prevents Fire, Accident Hazards

ASA Approves Underwriters' Laboratories Tests for Radio Receivers

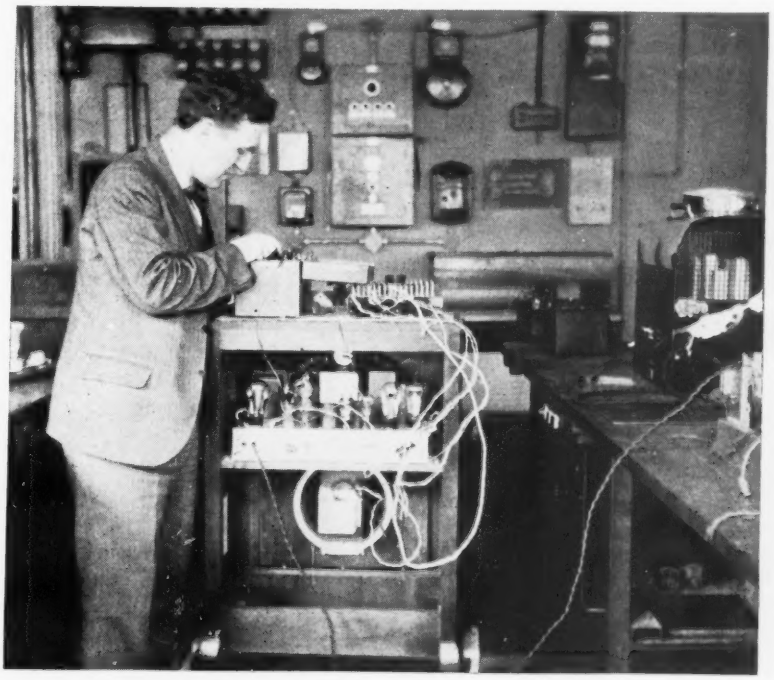
by

H. B. Smith

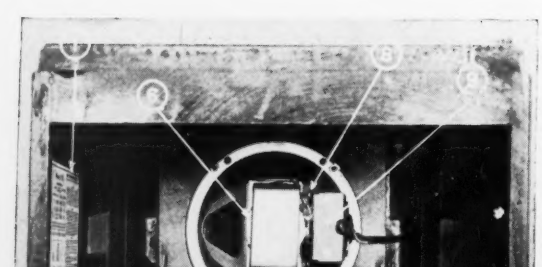
Associate Electrical Engineer
Underwriters' Laboratories, Inc.

DURING the latter part of December, 1936, the Standard for Power-Operated Radio Receiving Appliances, sponsored by Underwriters' Laboratories, Inc., was given approval by the American Standards Association and is now a recognized American Standard. It seems appropriate, therefore, to offer a word of explanation regarding the standard—what it is, how it was developed, and how it is used.

On the inside cover of the National Electrical Code, as published by the National Board of Fire Underwriters, you are informed that "Fully detailed specifications for construction and for performance under test and in service of electrical fittings and materials for use under the regulations of this Code are given in the Standards of Underwriters' Laboratories." The Stand-



Testing a radio receiver to determine operating temperatures.



Rear view of a radio set with chassis and loud speaker assembled and tubes in place ready for operation. Significant features are numbered.

1. Marking, paper label secured effectively to cabinet woodwork.
2. Marking, paper label effectively secured to chassis flange bearing a letter which, upon reference to the same letter appearing in cabinet label, assigns the electrical rating of the chassis.
3. Flexible cord, Type PO-64 labeled.
4. Bushing, fiber, effectively beaded to metal, at least 3/64 in. wall, smooth and well-rounded cord surfaces.
5. Knot, preventing power cord from being pushed into chassis interior.
6. Field winding and its splices protected with insulation at least 1/32 in. thick, impregnated.
7. Attachment plug cap, listed, conductors routed around the blades for strain relief.
8. Output transformer primary winding and its splices protected with at least 1/32 in. insulation at the sides. Secondary winding wound over primary winding. Both windings impregnated.
9. Fiber guard over terminal plate at least 1/32 in. thick, screwed on.
10. Spacing from chassis to cabinet floor, approximately $\frac{1}{4}$ in.
11. Wood shelf with openings in front of chassis flange and $\frac{1}{2}$ in. openings over trimmers deeply recessed.

ard for Power-Operated Radio Receiving Appliances is one of 52 such electrical standards published by Underwriters' Laboratories, Inc.

This radio standard is a complete set of requirements for receiving appliances, covering the features which have a bearing on fire and accident hazards. To be considered acceptable, any device submitted to Underwriters' Laboratories, Inc., must be at least the equivalent of what is called for in the requirements; but a receiver may be—and a great many are—considerably beyond the minimum requirements, both with respect to details of construction and test performance. A radio receiver which has been passed by the Laboratories under the requirements of the standard is considered to be well enough constructed and capable of successful performance to the extent that fire and accident hazards incident to its use have been reduced to an acceptable degree.

Tests for Safety

Underwriters' Laboratories, Inc., is not particularly concerned with features other than fire and casualty hazards, and does not investigate a radio receiver with respect to its size, shape, or general appearance, its selectivity, sensitivity, and fidelity, nor the various refinements of control and station selection.

Definite standards—established requirements—are particularly desirable from the Laboratories' point of view because of the work carried on continuously at the three testing stations at Chicago, New York, and San Francisco. A ruling given to a submittor at New York must, as far as humanly possible, be the same as that given to a radio manufacturer at Chicago or San Francisco. Many years of experience have shown that the surest way to eliminate the variables of the human equation and to insure uniformity of rulings by the engineers at the three testing stations is to establish standard requirements for a product which has reached the stage where standardization is practicable.

Outside of the Laboratories' organization, the standard is used principally by the radio manufacturers whose receivers have been or will be submitted for examination and test. Each manufacturer naturally wishes to know as closely as possible just what requirements his receiver will have to meet. With definite specifications before him many problems of design and production are greatly simplified for the manufacturer, and he is frequently able to proceed with expensive dies, tools, and molds without hesitation. In a competitive line such as radio, the existence of a set of established requirements is of no little satisfaction to a manufacturer as it assures him that

receivers made by another manufacturer, if they are to be listed by the Laboratories, will have to be at least up to the standard in quality or merit.

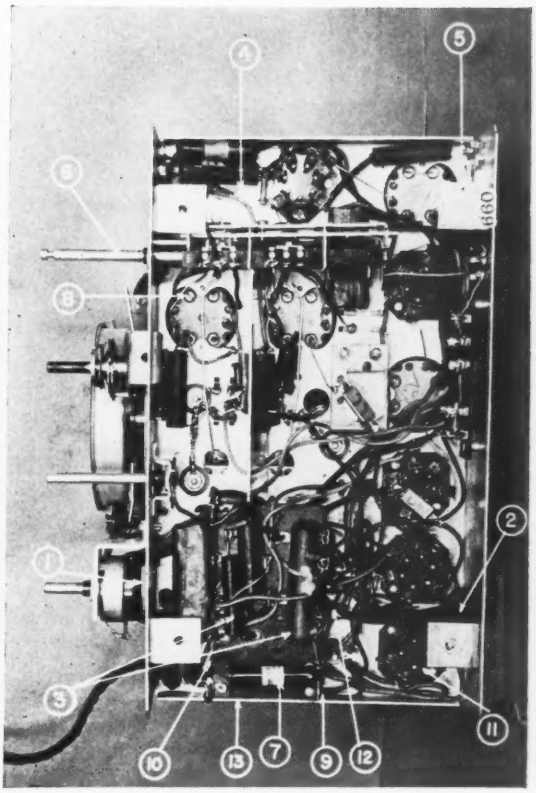
Radio is a good example of what may happen in the introduction and development of a new product and the establishment of definite requirements. Twenty years ago there were no radio sets as far as the general public was concerned. Fifteen years ago there were quite a number of crystal sets in operation, but vacuum-tube sets were relatively scarce. Ten years ago there were many vacuum-tube sets in use, but practically all of them were operated by means of the so-called A, B, and C batteries. Battery-operated sets were not listed by the Laboratories; and it was not until about 1926, when A and B-battery eliminators were devoloped, that power-operated radio receiving appliances were submitted to the Laboratories. The eliminators were superseded within a year or two by power packs built into the receivers themselves; and from about 1927 to the present time practically all radio receivers have been complete and self-contained, with only an external supply cord to be plugged into a convenience outlet.

When the first power-operated radio receiving appliance was submitted to the Labororatories, it was judged on its merits with respect to the fire and accident hazards involved, as there were then no specific radio requirements. The second radio appliance submitted was likewise judged on its merits, but with reference to what had been called for in connection with the acceptance of the first one. Appliances submitted subsequently were judged similarly, except that with the Laboratories' increased experience with radio receivers, it was possible to formulate some more or less definite requirements for the class.

The requirements for radio appliances then became well enough established so that, with the cooperation of the radio manufacturers, a standard was published in July, 1928. Many changes and new developments have occurred in radio during the past eight years and it has been necessary to revise and re-issue the standard a number of times, the present January, 1935 issue being the fourth edition.

ASA Approves Revision

A number of changes in and additions to the January, 1935 edition were made in August, 1935 —several pages having been re-issued—and it is this revised edition which now has ASA approval. It is contemplated that a fifth edition of the standard will be published in the near future, with some further changes in and additions to the re-



Interior of a radio chassis. The parts shown here are subject to standard tests to prevent fire and accident hazards.

1. Fiber, 1/32 in., riveted to switch assembly and protecting switch terminals.
2. Knot for strain relief.
3. Resistors and capacitors, dressed to prevent accidental contact with parts of other circuits and polarities.
4. Interior wiring, insulated with a cotton wind, 1/64 in. rubber wall, and over-all cotton braid.
5. Tapped hole in each corner by which chassis is screwed to cabinet.
6. All spindles at chassis potential.
7. Resistor, vitreous enameled type.
8. All trimmer capacitor adjusting screws involving d-c potentials within chassis interior.
9. All wiring dressed away from the vitreous enameled resistor.
10. Opening in chassis floor bushed with a sheet of insulating material for power transformer leads.
11. All sockets, phenolic composition.
12. Primary circuit splice, insulated with rubber and friction tapes.
13. All iron or steel parts are protected against corrosion by cadmium plating or other acceptable methods.

quirements which are about to be submitted for ASA approval.

Although the vast majority of radio receivers are straight alternating-current devices, the standard covers also receivers for use on direct current only, as well as the so-called "universal" receivers.

The requirements call for a complete and substantial enclosure, with reactors and capacitors and conductively connected to the supply circuit housed in noncombustible material. The type of flexible cord for connection to the supply circuit is specified, and provision is made for suitable bushings and strain relief in connection with the cord.

Detailed Specifications

Substantial transformers with impregnated coils are specified, and definite limitations are placed upon the ventilating openings in transformer enclosures. Capacitors are required to present no undue fire hazards. Appropriate insulated conductors are required for all internal wiring, and spacings throughout a receiver are specified.

Special attention is given to the accessibility of live parts. In general, service men and qualified amateurs can be counted on to exercise good judgement in their work on receivers which may need attention; but sets must be made as safe as possible for these people and more particularly for novices and children who may tamper with the chassis and who might be seriously injured by contact with current-carrying parts when poking about within a receiver with a screwdriver or a wire.

The rating test is made to insure that the marked rating of a receiver is the actual rating of the device. Knowledge of the rating is useful to an inspector in determining whether or not a branch circuit will be overloaded by the connection of the receiver. The watts input, as measured by a wattmeter or calculated from volt-ampere readings, is checked according to the provisions of the rating test specified in the standard. In general, the power input to a receiver is not permitted to exceed its marked rating by more than five per cent.

The temperature test provides for the measurement of the temperatures of the various parts of a receiver, in order that the suitability of the materials used and the possibility of ignition may be judged. Temperatures are observed by means of thermocouples located at various points on or within a receiver as may be appropriate. Temperatures attained on the external surface of a noncombustible cabinet or enclosing case, or temperatures on the internal surface of a combustible cabinet are not permited to be higher than 90 C under normal conditions; and temperatures attained at any points on or within a receiver are not permitted to be high enough to affect injuriously the material used in the construction of the device.

The maximum-voltage test is conducted for the purpose of determining the voltages of the various circuits, in order that they may be multiplied by specific factors to be used as test values for the dielectric-strength tests. The maximum voltages are also used as a basis for determining whether or not accessible live parts shall be guarded to prevent the user from making accidental contact with them. Parts operating at potentials in excess of 150 volts dc are considered to be hazardous, and for this reason adequate guarding is required. Voltages are investigated with a potential of maximum rated voltage and frequency applied to the primary conections and under any condition of removed vacuum tubes, removed plug connectors, or adjustment of user controls, etc.—but not under the condition of a removed part that is permanently wired or fixed or the adjustment of a primary tap, fuse, or other "non-serviceable" control.

The dielectric-strength test insures that the insulation and spacings of a radio receiver provide an adequate margin of safety over the potentials for which the device is rated, and insures that the various circuits are suitably isolated. In general, a 60-cycle potential of 900 volts is used in connection with the testing of parts in the primary circuit, and between the primary and the secondary circuits. A potential of three times the normal maximum voltage is applied generally to all secondary circuits; and this test voltage is obtained by impressing on the primary a potential of three times the rated voltage of the receiver, and at a frequency of three times its rated frequency in order to avoid saturation of the transformer core.

Power-operated radio receiving appliances which comply fully with the requirements for construction details and test performance, the essential features of which are described above, are eligible for listing under the Reexamination Service of Underwriters' Laboratories, Inc.

Norwegian Standards For Testing Whale Oil

Draft proposals for standard methods of tests for whale oil prepared by the Norwegian national standardizing body have been received by the American Standards Association. Copies may be borrowed from the ASA Library.

Hosiery Makers Association Starts Promotion of Standards

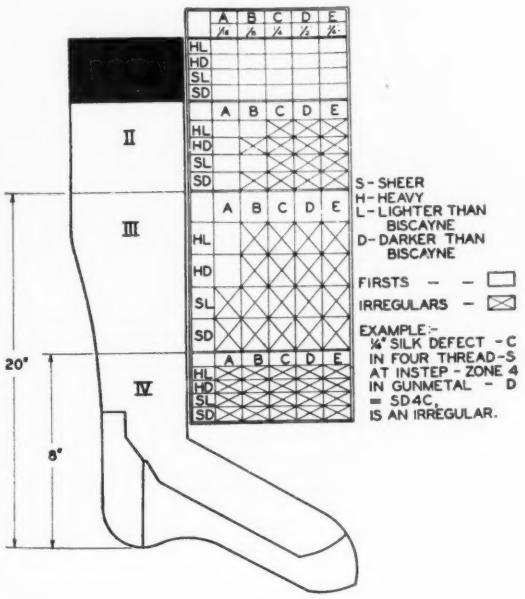
THE National Association of Hosiery Manufacturers has started a campaign to secure general adoption of its Standards of Construction and Inspection for Ladies' Full-Fashioned Hosiery.

An inspection chart has been prepared outlining instructions to inspectors, with definitions for "sheer" and "heavy", "light" and "dark", and sizes of irregularities which determine the grade of a stocking.

Inspection Zones

A diagram of inspection zones indicates what irregularities may be permitted in each of the four zones of a First-Quality stocking. Examples of silk irregularities are shown in photographs.

Hosiery meeting the standards of the hosiery manufacturers may be graded according to the irregularities discovered and marked with designs to indicate what grade they come under. The designs of the transfers for marking the hosiery have been trade-marked, and the Association will execute license agreements for the use of the trade-marked designs with all companies whose manufacturing practices harmonize with the requirements of the standards.



According to the findings of an inspector of the number of irregularities in the four inspection zones, a stocking may be labeled Standard A irregulars, Standard A seconds, Standard B, Irregulars Standard B, Seconds Standard B, Sub-Standard, Sub Standard Irregulars, or Thirds. The first grade is not labeled.

"The National Retail Dry Goods Association recognizes the standards as being an important and desirable step in the direction of improving quality and grading,' says the National Association of Hosiery Manufacturers. "Within the last week the retail organization sent a letter to the heads of leading retail stores in the country, conveying its endorsement of the standards. The N.R.D.G.A.'s Committee on Merchandise Standards, of which Harold Brightman is chairman, has reviewed the whole program and believes it is a forward step in supplying the consuming public with more dependable grades of merchandise."

The standards cover construction, as well as inspection. "The Standards of Construction set up minimum requirements of a character which assure full measure," the Association says. "A manufacturer may not go below these minimum construction specifications unless he so marks his products by grade. The present practices of most manufacturers undoubtedly come within the requirements of the standards, and therefore will not require any adjustments. Other manufacturers will be able to harmonize their practices with standards, with relatively slight revisions.

"The Standards of Inspection furnish for the first time a uniform method of inspection. By the device of zoning the stocking and reducing the dependence on the human eye, the method assures practical uniformity in the grading of the product as to quality. The method, applied by two or more inspectors separately to a given lot

A First-Quality Stocking

The chart shown here indicates what irregularities are allowed for a First-Quality stocking. The blank spaces show permitted irregularities. None of the irregularities may be more than ¾ in. In Sections I and III they may not be more than 1/16 in., and no irregularity, however small, is permitted in Section IV.

of hosiery, will produce substantially the same result in each case.

"The Association has entered into license agreements with the manufacturers of transfers whereby they may furnish such transfers only to those manufacturers who have secured a license for the use of the designs.

"The Association believes that the market will increasingly demand merchandise which meets the minimum requirements of the Standards, and their general acceptance will prove profitable to the industry as well as to those who purchase its product."

Tools in Industrial Progress

Standards should be regarded as tools to aid industrial progress, not as a wall to restrict development. Standards, therefore, must be flexible, adjusting themselves to advance in design and research.—*Harry T. Woolson, president, Society of Automotive Engineers.*

ASA Enlarges Masonry Project

Building code requirements for masonry, considered for some time by the Building Code Correlating Committee for development under the procedure of the American Standards Association, have now been included with the project on good practice requirements for brick masonry (A41).

The enlarged project, under the administrative direction of the National Bureau of Standards, includes good practice recommendations and building code requirements for all types of masonry. Suitable working stresses of masonry and masonry materials will be determined for this work by the Advisory Committee on Working Stresses recently named by the Building Code Correlating Committee.

Much of the original program of this sectional committee has already reached the draft stage and will go forward under the new arrangements without delay.

The committee on brick masonry was originally authorized in 1928 to prepare a manual of good practice. At that time, the Department of Commerce Building Code Committee was working on building code requirements. The sectional committee was organized, therefore, with a scope which prohibited the formulation of regulations intended for legal adoption by municipalities, in order that the work of this committee would not overlap that of the Department of Commerce committee.

Centralization of the building code program under the American Standards Association in cooperation with the National Bureau of Standards in 1933 led to a reorganization of ASA projects on masonry. Careful study showed that one committee could profitably handle both the manual of good practice for brick masonry and also the building code requirements for all types of masonry. The members of the sectional committee on brick masonry approved this suggestion. In accordance with recommendations of the Building Code Correlating Committee, therefore, the combined project was authorized by the ASA, with the National Bureau of Standards as administrative director, under the general supervision of the Building Code Correlating Committee.

New Tentative Standards Published by A.S.T.M.

The 1936 edition of the Book of A.S.T.M. Tentative Standards (1,390 pages) contains 264 tentative specifications, methods of test, and definitions of terms covering widely used engineering materials. A large number of the standards are included in this publication for the first time.

During 1936 important amplifications and changes were made in a number of existing specifications and all of these are given in the 1936 edition in their latest approved form. In addition to the tentative standards there are included also all of the proposed revisions of formal A.S.T.M. standards, these revisions being published for criticism before final adoption.

Copies in cloth binding at $8.00 each, or in heavy paper cover, $7.00, may be obtained from the American Society for Testing Materials, 260 S. Broad Street, Philadelphia, Pa.

SAE Starts Four New Standardization Projects

Since the first of the year, the Standards Committee of the Society of Automotive Engineers has scheduled four new projects for standardization, and revisions of two existing standards.

The new subjects are ratings for electrical equipment, engine and chassis number locations, anti-freeze solutions, and tap drills. Standards to be revised are those for fuel-pump mountings and leaf springs.

Foundrymen's Association Issues Two Standards for Dust Control

The first two codes in a series of approximately 25 recommended practices being developed by the Industrial Hygiene Codes Committee of the American Foundrymen's Association have been approved and published. The codes are intended to assist in the standardization of dust-eliminating methods and improvement of shop-operating conditions in the foundry industry.

The two codes now available are:

Tentative Code of Recommended Practices for Testing and Measuring Air Flow in Exhaust Systems 36-27

Tentative Code of Recommended Practices for Grinding, Polishing, and Buffing Equipment Sanitation 36-28

Code 36-27 is prepared to aid in the standardization of the general type of instruments and technique employed in determining the volume and velocity of air flow in exhaust systems. It covers the application and testing technique for pitot tubes, inclined and vertical manometer gauges, revolving vane type direct reading velocity meters. The thirteen figures contained in this code add greatly to the methods described.

Code 36-28 describes recommended practices for the ventilation of all grinding, polishing, buffing, scratch brushing or abrasive cutting-off wheels, and grinding or polishing straps or belts and is very similar to the new State of Illinois Buffing and Polishing Equipment Sanitation Law which many of the A.F.A. Industrial Hygiene Codes Committee members helped to draft. A series of definitions is followed by sections on applications for hood and branch pipe requirements, design of exhaust systems, testing exhaust systems and hood and enclosure design and minimum air velocity required. The numerous illustrations will be found very helpful in aiding plant engineers in designing effective equipment.

The American Foundrymen's Association is represented on the Sectional Committee for the Safety Code for Exhaust Systems, which is working on national standard safety codes to help solve the problem of industrial diseases due to toxic dusts and gases.

Copies of the two American Foundrymen's Association codes may be obtained from the A.F.A., 222 West Adams Street, Chicago, at $2.00 each.

Add to Regulations for Oil-Burning Equipments

Additions to the Regulations for the Installation of Oil-Burning Equipments, approved by the National Fire Protection Association, have been made available in the form of a sheet to be inserted in the 1934 edition of the standard regulations.

Copies may be obtained from the National Fire Protection Association, 60 Batterymarch Street, Boston, Mass.

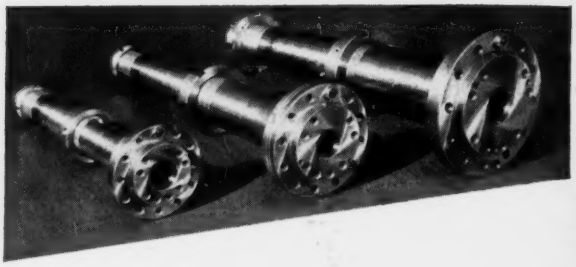
Canadian Association Considers Rules on Radio Interference

Radio interference is to be the subject of a conference to be called by the Canadian Engineering Standards Association.

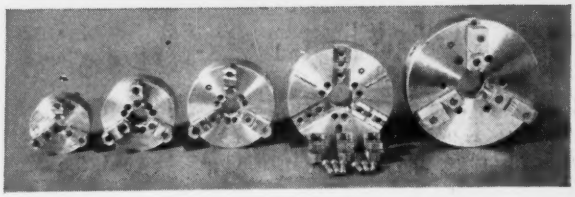
The conference will discuss the regulations for the suppression of radio interference under the Canadian Broadcasting Act of June 19, 1936.

New Machine Tool Standards

American Standard Lathe Spindle Noses for Turret Lathes and Automatic Lathes (B5.9-1936)
50 cents



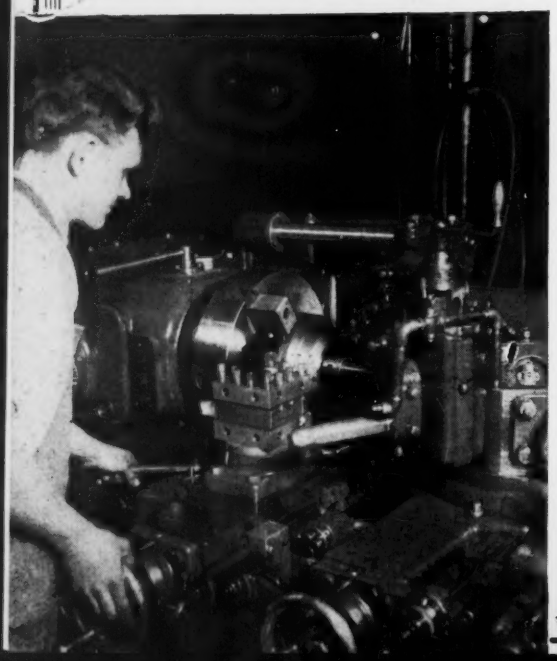
American Standard Chucks and Chuck Jaws for Turret Lathes and Automatic Lathes (B5.8-1936)
45 cents



American Standard Circular and Dovetail Forming Tool Blanks (B5.9-1936) ---------- ***40 cents***

American Standard Machine Tapers, Self-Holding Taper Series (B5.10-1937) ---------- ***50 cents***

Greater Interchangeability in Shop Practice



(Under the supervision of the American Society of Mechanical Engineers; National Machine Tool Builders' Association; Society of Automotive Engineers)

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